PALYNOLOGICAL STUDY OF LOWER PANNONIAN STRATA IN THE REGION OF GÖRÖMBÖLY

by

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Research work has so far included a pollen analysis of the near-surface, i. e. Quaternary, deposits of the Great Hungarian Plain, and also of the very thick Upper Pannonian basin filling sampled from deep borings. Of particular value seemed to be the material of the upper member of the Lower Pannonian succession sampled by GY. VITALIS at Csoznyatető, as its palynological treatment evidencing a basin margin sedimentation could enable us to make a considerable progress towards a better understanding of the Pliocene-Pleistocene stratigraphy.

It was sampled in a hill landscape of about 230 m height a. s. l., bordering the Bükk Mountains from the SE. Borehole IV-8 lies at a distance of round 300 m from borehole X-8. The upper part of the succession 30 m thick is made up of silts with limonite patches of a reddish stain intercalated locally by thin layers of mediumgrained sands; deeper on there are argillaceous silts.

As far as our knowledge goes, there are no palynological results concerning the Lower Pannonian in the Hungarian literature. Closest in geological time and space are the results obtained by E. NAGY [1958] during the examination of the Upper Pannonian brown coal deposits at the foot of the Mátra Mountains. Valuable results were furnished by É. PLANDEROVA's [1965] palynological treatment of the Tertiary at the northern fringe of the Danube Plain, Czechoslovakia. Dating by M. SZÉLES based on Ostracoda fauna classifies the whole succession of strata as Lower Pannonian. The only exception is made for the overlying sediments of Pleistocene age. Unfortunately, no description of macroflora from this well-explored area is available, though such information would largely improve palynologist's work, and in some cases even complete it.

LOWER PANNONIAN DEPOSITS

The palynological results could be represented on a diagram for the interval of 15 to 19 m of borehole IV-8 and for that of 22 to 27 m of X-8 on the basis of at least nearly 100 pollen grains. The left side of the diagram shows the distribution of all the arbor pollen grains by an areal method of representation, thus trying to portray the variation in the composition of the arbor spectrum within each particular bed and with depth. The rest of the palynological cross-section shows

detailed percentages with information on the pollen population of trees, shrubs, soft-stemmed phanerogams, cryptogams, and plant microfossils.

The diagram also includes older forms such as *Podocarpus*, *Extratriporopollenites*, Meliaceae, *Lygodium* which may have been redeposited with the sediment.

Lithologically, the samples from 15 m and 16 m of borehole IV-8 are made up of light-green silty mud; their floristic pattern is determined by the conifers whose Tertiary representatives are *Tsuga* and *Pinus haploxylon*. The samples from 18 m and 19 m depth are composed of a dark-grey argillaceous mud whose attack by hydrochloric acid released some gaseous hydrogen sulphide, an evidence for anaerobic conditions. In their pollen spectrum the ratio of the Tertiary forms was found to be prominent which is somewhat due to the presence of Tertiary conifers. A marked boom of deciduous forest is observed. It includes *Acer*, Ulmaceae, *Fagus*, *Quercus* confined to a rather dry habitat as well as *Betula*, *Alnus*, *Liquidambar*, *Carya*, and *Pterocarya* requiring more humidity in the soil. The presence of a water cover is suggested by the appearance of *Nyssa*, *Engelhardtia* associated with *Myrica* and the representatives of Ericaceae at the shrub level. Plants growing in a waterlogged environment are also the representatives of Pteridophyta such as *Osmunda*, Polypodiaceae, and Lycopodiaceae. They suggest the presence of a minor pool bordered by the deciduous forest.

In the material sampled from hole X-8 drilled a little distance to the north, the argillaceous mud became humified not higher than at 23 and 24 m depth, the rest of the samples being light-coloured. Palynologically, the greatest percentage ratio represented by the largest area on the diagram belongs to the pollen grains of *Pinus* and *Picea* suggesting a drier habitat. Humification is associated merely with an increase in the population of pollen grains (211 and 250 arbor grains, respectively), the forest pattern of the stratigraphic succession being of rather dry type. The proximity of water is indicated by the occurrence of *Alnus*, *Betula*, and *Salix*. At the shrub level the ratio of *Myrica* and Ericaceae pollen grains has decreased. *Rhus*, *Ilex* and *Corylus* may have grown on well-insolated slopes. Grassy vegetation grown at the fringes of forests: Monocotyledones, Gramineae, and *Artemisia*, a form tolerant of drought. The sedimentation of the material of X-8 appears to have taken place close to the water, but on a rather steep slope.

That the Pannonian inland sea must have been close is indicated by the abundance of the pollen grains of Chenopodiaceae, a family always concomitant of salt accumulation. It is present consistently in both boreholes, with a ratio of about 10 per cent. The same holds true for Hystrichosphaeridae, a marine microfossil represented by 2 or 3 or 4 specimens in each layer, Their joint occurrence suggests a near-coast environment [W. H. ZAGWIJN 1960, V. D. BREILE 1963]. Their presence even in samples with a very scant pollen-spore content such as those from the reaches deeper than 17 m of X-8, make believe that this was the place where the bay of the inland sea lay closest. The same holds true for the interval of 25 to 30 m of borehole IV-8.

The samples from the uppermost interval of 10 or 15 m, respectively, are extremely poor in pollen, but Ostracoda fauna is completely lacking. Still, with a view to its lithology, we can assign the succession to the Lower Pannonian stage. We may do so even because the sands overlying the upper member of the Lower Pannonian are sterile as shown by deep boring performed in the basin (personal communication by M. SZÉLES).

The sedimentation of the upper member of the Lower Pannonian seems to have taken place in the littoral zone of the inland sea. Special circumstances of

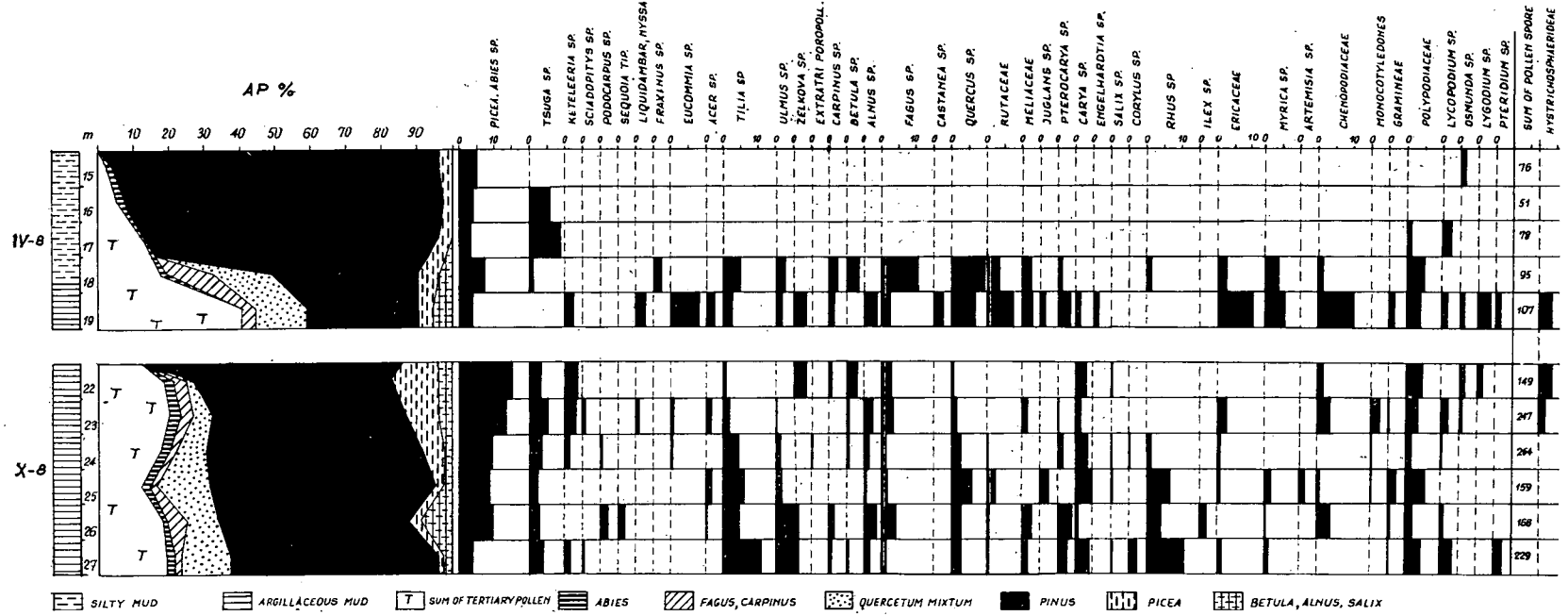

Fig. 1. Pollen diagram of boreholes Nos. IV-8, X-8 within the area of the Csoznyatető.

emplacement may have been responsible for the Lower Pannonian succession composed uniformly of argillaceous muds, a formation rather uncommonly thick for a marginal facies.

PALAEOCLIMATOLOGICAL CONCLUSIONS

The floral pattern shows a climate warmer and more humid than the present one is. The plants represented by the pollen assemblage are now-living genera, but their percentage distribution permits to conclude on a more humid climate. This more balanced, less continental climate was provided by the immediate neighbourhood of the Pannonian inland sea. The high percentage of the pollen grains of *Pinus* has resulted from local setting, for the area under consideration lay in a valley almost completely open to the north. So the winds which turned from time to time northerly could produce a cooling effect as well as they could carry the pollen grains of *Pinus*. In leeward places, however, the more eurythermous genera such as *Engelhardtia, Eucommia, Pterocarya, Nyssa,* and *Liquidambar* couldsubsist.

PLEISTOCENE

The near-surface strata were also found to contain few pollen grains. An assemblage sufficient for evaluation has been furnished by the samples taken from the brownish-grey silty mud of borehole X-8. In their arbor pollen spectrum the predominant conifers are associated with a marked ratio of mixed oak and birch. From the grassy vegetation Gramineae were encountered in every layer. At a depth of 1 m *Polygonum bistorta* and *P. convolvulus* represent antropophilic elements. This near-surface layer can be placed in the Riss—Würm interglacial, the last interglacial period of the Pleistocene Ice Age. After it, aforestation could proceed slowly so that the development of a gallery forest may be thought of. The lower boundary of the Pleistocene is obscure, being traceable rather vaguely indeed.

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